

**REMARKS**

In the Office Action, claims 1-51 were rejected. By the present response, claims 1, 8, 15, 22, 28, 37 and 45 are amended. Upon entry of the amendments, claims 1-51 will remain pending in the present patent application. Reconsideration and allowance of all pending claims are requested.

**Rejections Under 35 U.S.C. § 102**

In the Office Action, claims 1-5, 7, 12-13, 15-17, 19-23, 25-27, 45-47 and 49 were rejected under 35 U.S.C. § 102(b) as being anticipated by Sprangle et al., U.S. Patent No. 5,353,291 (hereinafter “Sprangle”). Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. Applicants respectfully assert that the present invention, as recited in amended independent claims 1, 15, 22 and 45 is patentable over Sprangle.

Independent claims 1, 15, 22 and 45 are amended to more clearly point out certain of the claimed subject matter. Specifically, each independent claim now recites, in generally similar language, *a laser source disposed in a laser cavity*.

Sprangle discloses a laser source 22 that generates a laser beam 12. In addition, Sprangle states that the laser beam 12 enters the ring resonator 56 formed by mirrors 26, 28, 34 and 36. *However, the reference does not teach or disclose a laser source to be present within the interaction chamber or even within the ring resonator.*

In formulating the rejection, the Examiner stated, “[t]he cavity is created for the purpose of circulating laser light from a source (22) for interaction with an electron beam.” The examiner also stated, “[a]dditional laser light is generated within the laser cavity by the recycler or low gain amplifier (42). In this way, laser light is generated in a laser cavity.”

Applicants respectfully submit that the recycler or amplifier (42) is not capable of generating laser light. The laser beam 12 already introduced within the resonator ring 56 via an external laser source 22 is stretched, amplified and recompressed via the recycler or amplified via the amplifier, to compensate for any losses due to scattering or diffraction as the result of the operation of the mirrors and impact with the electron beams (*see*, Sprangle, column 4, lines 1-11). On the other hand, the laser source (a solid state laser rod 42) described in the present application is located within the laser cavity for generation of high-energy optical pulses. Thus, the laser beam 16 is *generated within* the laser cavity 20 and no external laser source is required. Applicants respectfully submit that the pump laser 38 as described in the present application is not same as the laser source 22 as disclosed in Sprangle as it is used to initiate the generation of lasing in the solid state laser rod disposed inside the laser cavity.

Further, a high-energy laser beam 16 is generated within the laser cavity 20 by the laser source described in the present application. No external Table-Top Terawatt (T3) laser system 22 is employed for generating a high-energy laser beam as disclosed by Sprangle (*see*, Sprangle, column 2, lines 6-20). The generation of the high-energy laser beam 16 in the claimed arrangement is local to (i.e., within) the laser cavity 20. Applicants respectfully submit that the generation of a high-energy laser beam without the use of external Table-Top Terawatt (T3) laser system is possible due to the placement of laser source within the laser cavity. This structure is materially different from that proposed by Spangle.

Accordingly, the reference simply cannot anticipate the subject matter of claims 1, 15, 22 or 45, as amended. Applicants therefore stress that Sprangle cannot support a *prima facie* case of anticipation of amended claims 1, 15, 22 or 45.

Claims 2-5, 7, 12-13, 16-17, 19-21, 23, 25-27, 46-47 and 49 depend directly or indirectly from claims 1, 15, 22 and 45. Accordingly, Applicants submit that claims 2-5, 7, 12-13, 16-17, 19-21, 23, 25-27, 46-47 and 49 are allowable by virtue of their dependency from an allowable base claim. Applicants also submit that the dependent claims are further allowable by virtue of the subject matter they separately recite. Thus, it is respectfully requested that the rejections of claims 1-5, 7, 12-13, 15-17, 19-23, 25-27, 45-47 and 49 under 35 U.S.C. §102(b) be withdrawn.

**Rejections Under 35 U.S.C. § 103**

Claims 8-11 and 50-51 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sprangle in view of Erbert et al., U.S. Patent No. 6,760,356 (hereinafter “Erbert”). Claims 6, 18, 24 and 48 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sprangle in view of Weingarten et al., U.S. Patent Application No. 2003/0174741 (hereinafter “Weingarten”). Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Sprangle in view of Antonell et al., U.S. Patent No. 6,760,356 (hereinafter “Antonell”). Claims 28-30, 32-38 and 40-44 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sprangle in view of Hartemann et al., U.S. Patent No. 6,724,782 (hereinafter “Hartemann”). Claims 31 and 39 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sprangle in view of Hartemann and further in view of Weingarten.

Independent claims 28 and 37 are amended to more clearly point out certain of the claimed subject matter. Specifically, each independent claim now recites, in generally similar language, *a laser source disposed in a laser cavity*.

Applicants respectfully submit that Sprangle, alone or in combination with other references, fails to teach, disclose or suggest the inclusion of laser source within the laser cavity for generation of high-energy optical pulses. The mere fact that Erbert discloses an amplification system and method using a combination of a

grating stretcher, a Yb:YAG laser rod and a grating compressor for providing a high average power laser beam is not sufficient to teach or suggest one skilled in the art the generation of X-rays via inverse Compton scattering using the high-energy optical pulses and pulsed electron beam in a laser cavity. Indeed, the reference does not relate at all to a system even capable of generating X-rays. Even if one were to use the laser system disclosed by Erbert as an external laser source 22 in Sprangle system for generation of laser beams, the references alone or in combination fails to render obvious the generation of laser beam *within the laser cavity* via a laser source *disposed within the laser cavity*.

At least because Sprangle, as discussed above, fails to teach or suggest generating such optical pulses in the laser cavity via a laser source located within the laser cavity, and as none of the remaining references were argued to do so, Applicants submit that a *prima facie* case of obviousness is not supported against claims 6, 8-11, 14, 18, 24, 28-44, 48, 50-51 for rejection under 35 U.S.C. § 103(a). Thus, it is respectfully requested that the rejections of claims 6, 8-11, 14, 18, 24, 28-44, 48, 50-51 under 35 U.S.C. §103(a) be withdrawn.

**Conclusion**

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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